

REMARKS/ARGUMENTS

Reconsideration and withdrawal of all outstanding grounds of rejection are respectfully requested in light of the above amendments and the remarks that follow.

The Examiner has rejected claims 1-6 and 8-16 under 35 U.S.C. 103 as unpatentable over Wetzler in view of Glezer et al. (Glezer).

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used Glezer's teachings to provide a plurality of grooves 84 instead of protruding elements 60 in Wetzler so as to increase convective cooling without increasing pressure losses.

It is respectfully submitted that the Examiner continues to misinterpret the disclosures in the applied prior art. Initially, the Examiner takes the position that Wetzler discloses a combustor liner 20 having "a plurality of axially spaced, annular protrusions 60 (cup-like) formed in an outside surface of said combustor liner 20, each protrusion 60 having a uniform cross-section and extending continuously about a circumference of said liner."

Initially, it is noted that the liner 20 is located radially inwardly of the casing 16 as clearly shown in Figures 1-3 and, accordingly, the radially outer surface of the liner 20 is shaped to incorporate concave cup-like portions 60. Figure 4 of Wetzler is said to be a partial plan view of the liner construction as viewed from the interior of the liner and thus, it is clear that the convex side of the cup-like portions 60 are on the interior surface of the liner. It is therefore not apparent why the Examiner has relied upon Glezer for its

teaching of concave dimples on the exterior surface of a combustor liner when Wetzler already discloses concave dimples on the exterior surface of the combustion liner 20.

Even more significantly, the Examiner's contention that the plurality of cup-like dimples 60 in Wetzler define a plurality of continuous circumferential grooves is simply not true. A continuous annular groove of uniform cross-section is by definition significantly different than a series of adjacent cup-like dimples as disclosed in Wetzler. The adjacent cup-like portions or dimples 60 in Wetzler define at best a discontinuous annular groove and, significantly, the cross-sectional shape necessarily changes at every incremental location about the circumference of the liner. This is easily demonstrated with reference to the attached sketches that show a semi-spherical cup in side elevation and plan views (Figs. B and A, respectively), with cross-sections through Fig. A taken at lines A<sub>1</sub>-A<sub>1</sub>, B<sub>1</sub>-B<sub>1</sub> and C<sub>1</sub>-C<sub>1</sub>. The sectional views are shown in Figures A<sub>1</sub>, B<sub>1</sub> and C<sub>1</sub>, respectively. Note the changes in cross-section and also note that the changes will be identical in any radial direction. It is also apparent that, at locations between the dimples or concavities, the cross-sectional shape will change yet again. Thus, the discrete annular array of dimples in Wetzler does not provide response for the requirement in claim 1 of "a plurality of axially spaced annular grooves formed in an outside surface of said combustor liner, each groove having a uniform cross-section and extending continuously about a circumference of said liner. Similarly, the discrete dimples of Wetzler do not provide response for the "first plurality of axially spaced, continuous circumferential grooves formed in an outside surface of said liner, angled relative to a direction of

cooling air flowing between said liner and said flow sleeve; and a second plurality of axially spaced, continuous circumferential grooves cris-crossed with said first plurality of axially spaced circumferential grooves wherein said first and second plurality of axially spaced circumferential grooves are uniformly curved in cross-section" in amended claim 9.

The secondary reference to Glezer also fails to remedy this deficiency in Wetzler. In this regard, the Examiner refers to Glezer as teaching a combustor liner 70 having a plurality of axially spaced annular grooves 84 formed in outside surface of the combustor liner 70 wherein each of the grooves 84 has a uniform cross-section. The Examiner's misinterpretation of the subject matter of Wetzler has carried through to his misinterpretation of Glezer. Elements 84 in Glezer are concave dimples, not axially spaced annular grooves as best appreciated from Figures 5-8. In column 3 of Glezer, it is stated that:

"The cold side 76 has a plurality of concavities 84 being dimples, depressions, or concave recesses."

Note that in column 4, Glezer describes the concavities 84 as follows:

In this application, each concavity 84 has a preestablished concavity depth 114 being about 0.0415 inches (0.105 cm) and a preestablished concavity diameter 116 being about 0.22 inches (0.56 cm) as shown in FIGS. 5 and 6. The concavities 84 are created using a conventional manner, such as machining, forming, molding, etching, pressing, stamping, or casting. The concavities 84 have a predefined concavity spacing 112. The concavity spacing 112 between a center of one concavity 84 to a center of an adjacent cavity 84' is constant and is about 0.275 inches (0.699 cm). FIG. 7 shows a repeating pattern of concavities 84 being arranged into a series of rows, for example, a first rows 118 and a second rows 120. The concavities 84 in the first rows 118 have a vertical concavity spacing 122 of

about 0.28 inches (0.71 cm) between concavities in the first row 118. The concavities 84 in the second rows 120 have the vertical concavity spacing 122 of about 0.28 inches (0.71 cm) between concavities in the second row 120. Centers of concavities 84 in the second row have a horizontal offset 124 from the centers of concavities 84 in the first row 118 of about 0.24 inches (0.61 cm). Centers of concavities 84 in the second row 120 further have a vertical offset 126 from centers of concavities 84 in the first row 118 of about 0.14 inches (0.36 cm). FIG. 8 shows the vertical concavities spacing 122 being about 0.44 inches (1.1 cm). The horizontal offset 124 of this embodiment is about 0.16 inches (0.41 cm) with the vertical offset 126 being about 0.22 inches (0.56 cm).

From this disclosure and from the clear illustrations in Glezer, it is readily apparent that the concave dimples of Glezer do not provide response for the limitations in independent claims 1 and 9 quoted above.

The Examiner's mischaracterization of discrete concave dimples as continuous annular grooves also manifests itself throughout the rationale applied in the rejection of dependent claims 2-6 and 8.

With respect to independent claim 10, that claim as amended requires "a plurality of axially spaced annular grooves formed in an outside surface of said combustor liner, each groove extending continuously about a circumference of said liner; wherein said grooves are semi-circular in cross-section based on the diameter D, and wherein a depth of said grooves is equal to about 0.05 to 0.50 D." Neither Wetzler nor Glezer discloses a continuous circumferential groove based on a diameter D as required by claim 10. It follows that the subject matter of claims 11-15 is also nowhere disclosed or suggested in the applied combination of references.

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Independent claim 16 has been amended to specify the continuous nature of the circumferential grooves and the arguments above apply equally as well to claim 16.

It is respectfully submitted that claims 1-6 and 8-16 are in condition for immediate allowance, and early passage to issue is requested. In the event, however, any small matters remain outstanding, the Examiner is encouraged to telephone the undersigned so that the prosecution of this application can be expeditiously concluded.

Respectfully submitted,

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